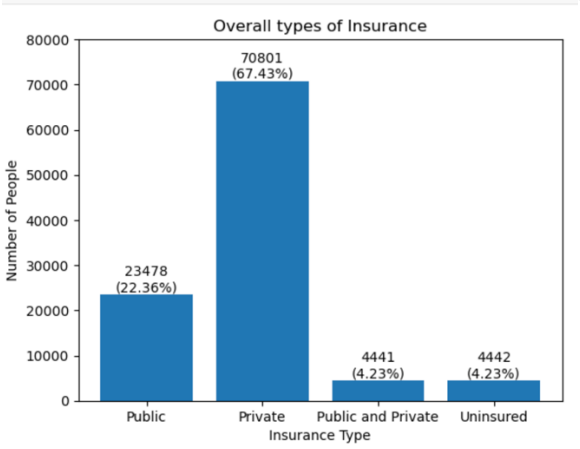
Comparative Analysis of Healthcare Access and Utilization Among Children with Public vs. Private Insurance in 2021-2022

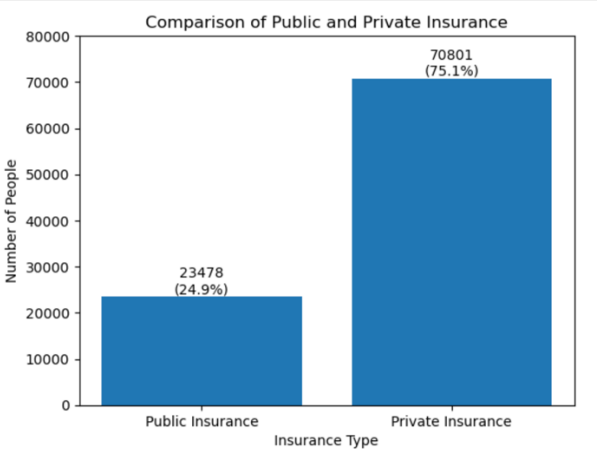
Introduction:

In this analysis, we will compare the health benefits and challenges faced by children with public versus private insurance. The dataset used is from a national survey conducted by the Child & Adolescent Health Measurement Initiative (CAHMI) for the years 2021 and 2022. CAHMI provides comprehensive data, including details on children's demographics, family background, community, health, and geographic factors. For this analysis, I have specifically focused on data related to children's health insurance coverage, access, quality of care, and basic demographics.

Data exploration:

The original dataset includes details of children insured by public, private, or both, as well as those who are uninsured. However, we will focus exclusively on data for children insured by either public or private insurance.





The variables in this dataset are categorical, either nominal or ordinal.

- HHID – unique id of each participant
- SC_AGE_YEARS - How old is this child? If the child is less than one month old, round age in months to 1.
- SC_SEX - What is this child's sex?
- FPL_I1 - Income based on federal poverty level status (0-99% FPL; 100-199% FPL; 200-399% FPL; 400% FPL or greater)

- INSURANCE_TYPE - Is this child CURRENTLY covered by any of the following types of health insurance or health coverage plans?
- MEDICAL_CARE - did this child see a doctor, nurse, or other health care professional for sick-child care, well-child check-ups, physical exams, hospitalizations or any other kind of medical care? Include health care visits done by video or phone.
- PREVENTIVE_CARE - how many times did this child visit a doctor, nurse, or other health care professional to receive a PREVENTIVE check-up? A preventive check-up is when this child was not sick or injured, such as an annual or sports physical, or well-child visit.
- DENTISTVISIT - Did this child see a dentist or other oral health care provider for any kind of dental or oral health care?
- SPECIALIST - Did this child see a specialist other than a mental health professional? Specialists are doctors like surgeons, heart doctors, allergy doctors, skin doctors, and others who specialize in one area of health care.
- DIFFICULTY_SPECIALIST - How difficult was it to get the specialist care that this child needed?
- HOSPITALER - How many times did this child visit a hospital emergency room?
- EYEDOCTOR - Has this child EVER seen an eye doctor? An eye doctor may be referred to as an optometrist or ophthalmologist.
- HOSPITALSTAY - Was this child admitted to the hospital to stay for at least one night?
- NEEDED_HEALTHCARE_RECEIVED - Was there any time when this child needed health care but it was not received? By health care, we mean medical care as well as other kinds of care like dental care, vision care, and mental health services.
- FRUSTRATED_TO_GET_SERVICES - How often were you frustrated in your efforts to get services for this child?
- A1_EMPLOYED - Which of the following best describes your current employment status?
- SPEND_TIME - How often did this child's doctors or other health care providers spend enough time with this child?
- LISTEN_CAREFULLY - How often did this child's doctors or other health care providers listen carefully to you?
- SENSITIVITY - How often did this child's doctors or other health care providers show sensitivity to your family's values and customs?
- PROVIDE_SPECIFIC_INFO - how often did this child's doctors or other health care providers provide the specific information you needed concerning this child?
- PARTNER - how often did this child's doctors or other health care providers help you feel like a partner in this child's care?
- VIDEOPHONECOVID - Were any of this child's health care visits by video or phone because of the coronavirus pandemic?
- COVID_CHILDCARE_UNAVAILABLE - has this child's regular day-care or other childcare arrangement been closed or unavailable at any time because of the coronavirus pandemic?
- Mental_healthcare - Has this child received any treatment or counseling from a mental health professional? Mental health professionals include psychiatrists, psychologists, psychiatric nurses, and clinical social workers.
- TREATNEED - How difficult was it to get the mental health treatment or counseling that this child needed?

Data cleaning (Python):

- Imported the dataset into a pandas dataframe. Reviewed the data types and checked for missing values using `isnull()`.

```
In [4]: #Data_cleaning
        #checks if there's null values and return true count, else false
        #there are no missing values here
        null_data = df.isnull()
        for column in null_data.columns.values.tolist():
            print(null_data[column].value_counts())
            print("")
```

```
HHID
False    104995
Name: count, dtype: int64

SC_AGE_YEARS
False    104995
Name: count, dtype: int64
```

- Replaced '?' values with `NaN` using numpy.

```
In [10]: #replaces all occurrences of the "?" character with `NaN`
         df.replace("?",np.nan,inplace = True)
         df.head(10)
```

Out[10]:

	HHID	SC_AGE_YEARS	SC_SEX	BIRTH_YR	FPL_I1	CURRINS	INSTYPE	INSGAP	HOWMUCH	MEDICAL_CARE	...	A1_EMPLOYED	A2_EMPLOYED
0	22000005	5	1	2017	400	1	2	1	5	1	...	1	1
1	22000021	8	2	2014	50	1	1	1	1	2	...	1	1
2	22000034	5	2	2016	50	1	2	1	1	1	...	5	1
3	22000037	6	2	2015	200	1	2	1	2	1	...	1	99

- Created a bar plot to compare the percentage of children with different types of insurance using matplotlib.

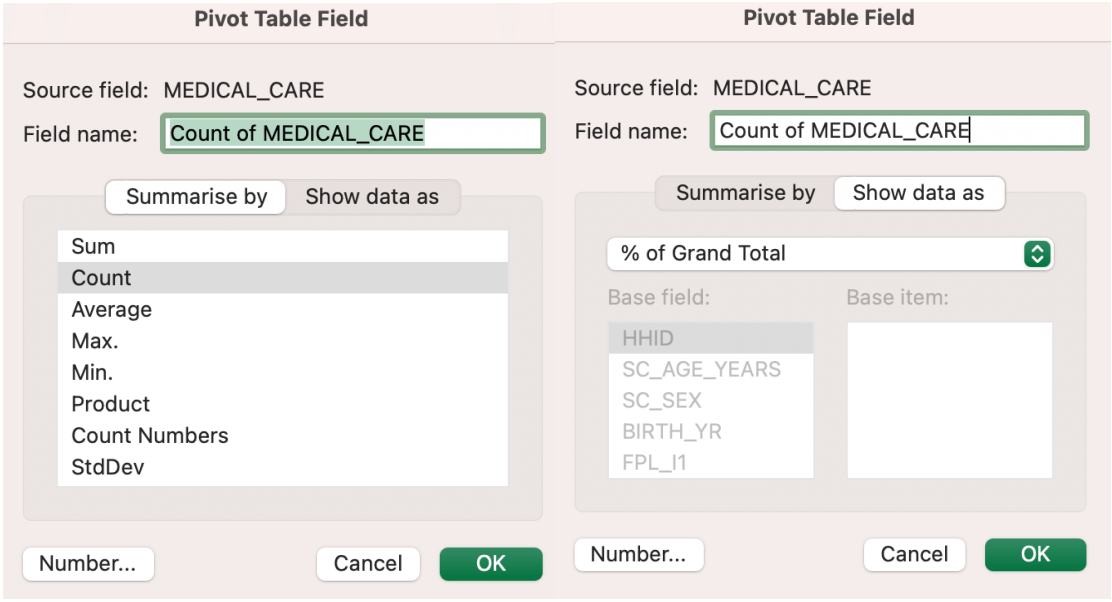
```
#overall percentage of types of insurance

overall_types = df['INSTYPE'].value_counts()

overall_percentages = (overall_types/overall_types.sum() * 100).round(2)

overall_labels = ['Public', 'Private', 'Public and Private', 'Uninsured']
overall_counts = [overall_types[1], overall_types[2], overall_types[3], overall_types[5]]
overall_percentages = [overall_percentages[1], overall_percentages[2], overall_percentages[3], overall_percentages[5

fig, ax = plt.subplots()
bars = ax.bar(overall_labels, overall_counts)

for bar, percentage in zip(bars, overall_percentages):
    yval = bar.get_height()
    ax.text(bar.get_x() + bar.get_width()/2, yval, f'{yval}\n({percentage}%)',
            ha='center', va='bottom', color='black')

ax.set(xlabel = 'Insurance Type', ylabel='Number of People', title='Overall types of Insurance', ylim=(0, 80000))

# Show plot
plt.show()
```

- Filtered the dataset to include only children with public or private insurance. The cleaned dataset is available for download as `filtered_data.xlsx`.

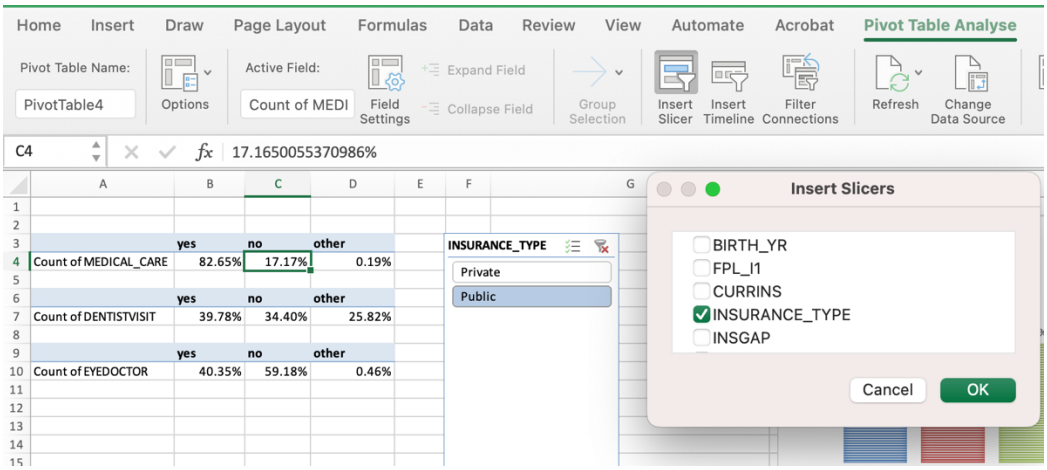
```
#Lets filter data where we have only insurance type is either public or private

# Filter data to include only Public and Private insurance types
df_filtered = df[df['INSTYPE'].isin([1, 2])]
df_filtered.to_excel('filtered_data.xlsx', index=False)
```

Data manipulation (Excel): I chose Excel for its user-friendly interface, robust built-in functions, and ease of creating visualizations. To compare different types of healthcare services (General Medical Care, Dental Care, Eye Care) for children with public versus private insurance, I utilized pivot tables and slicers to generate the bar charts.

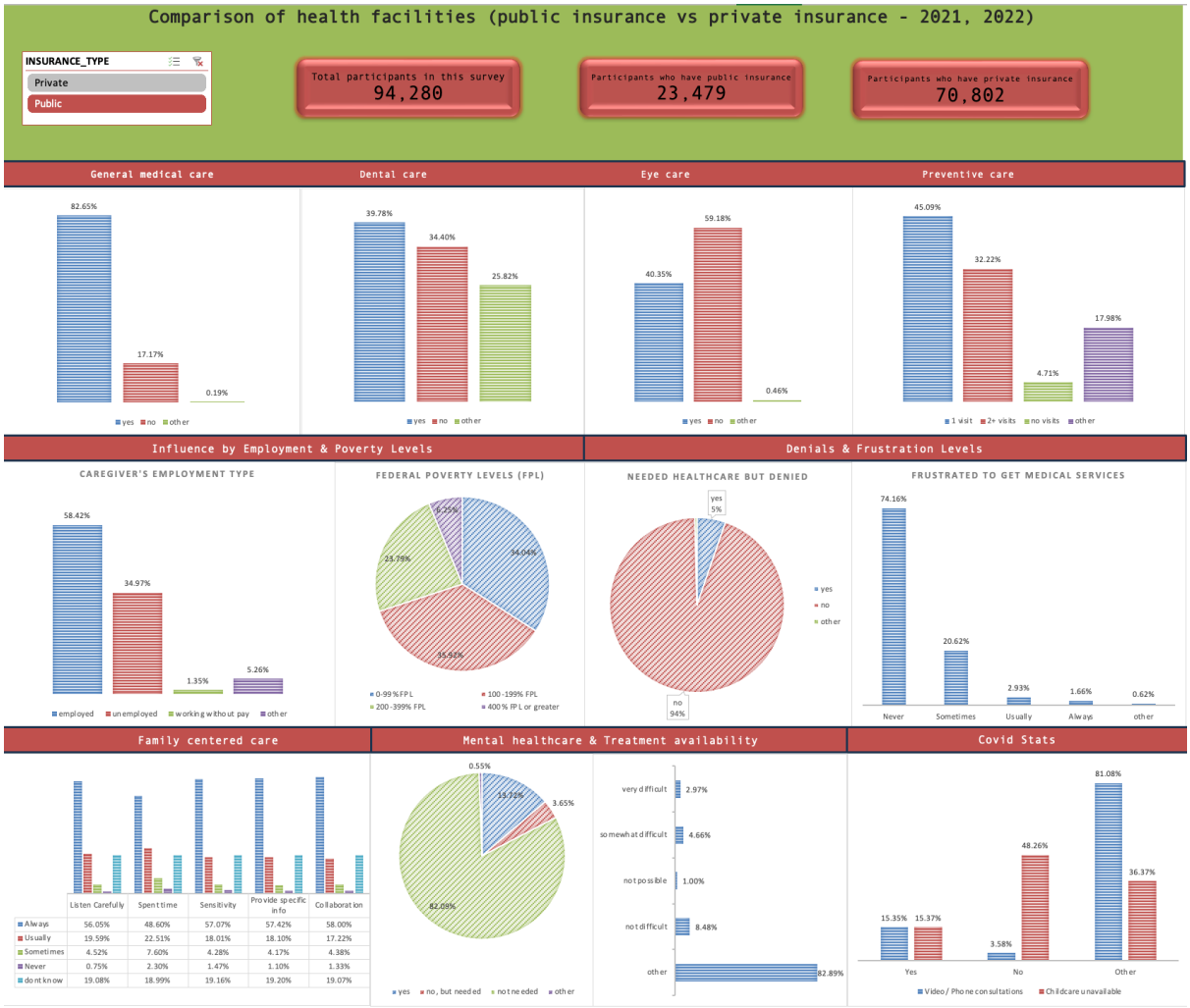
- For example, I created pivot tables by pulling the 'MEDICAL_CARE' variable into the Values and Legend sections.
- Formatted the values to summarize by count and display percentages of the grand total.



- After setting up the pivot table, selected the data and inserted a 2D column chart through Insert > Chart > 2D Column.
- Added a slicer for dynamic filtering by selecting PivotTable Analyze > Insert Slicer and choosing the 'INSURANCE_TYPE' column. This allows for seamless toggling between public and private insurance data views.



Data visualization: After creating the pivot tables and their corresponding charts/graphs, I consolidated them into a single worksheet to build a comprehensive, dynamic dashboard. This setup allows for an interactive experience where users can visualize the percentage distribution of various healthcare services and benefits by selecting either public or private insurance using the slicer at the top. This approach provides a clear and immediate comparison between the two insurance types in a single, cohesive view.

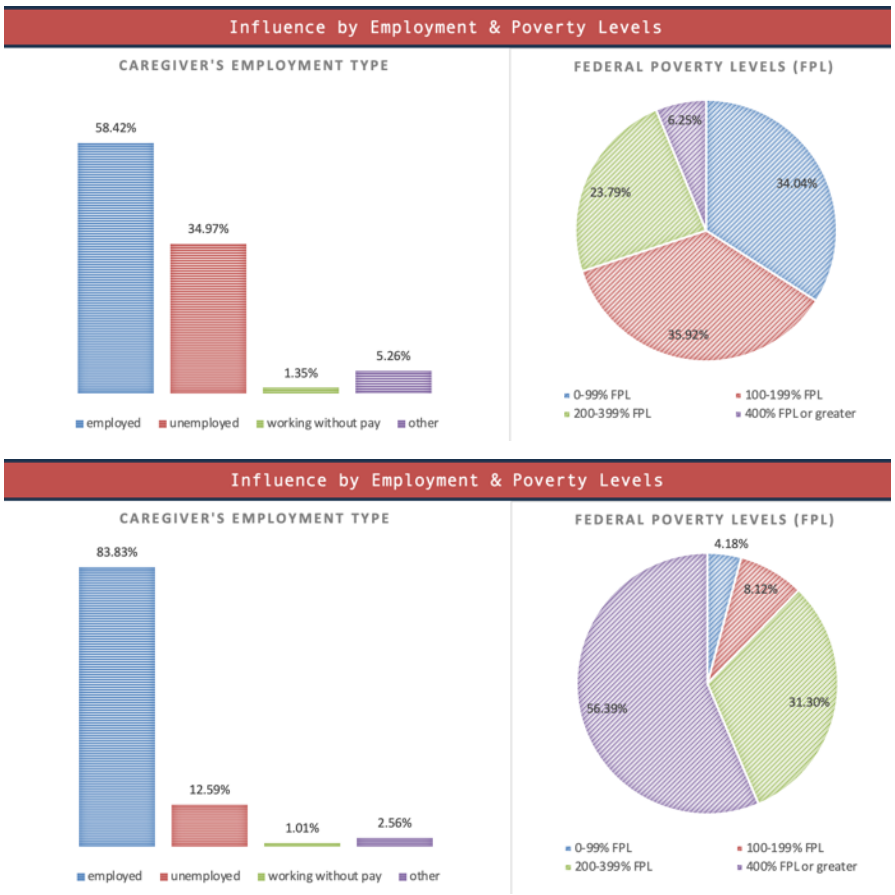


Important takeaways:

1. Overall comparison of different types of healthcare (General, Dental, Eye): Participants with private insurance predominantly received general medical care compared to those with public insurance. However, the dental and eye care charts reveal that a higher percentage of participants with public insurance received these services compared to those with private insurance.

2. Preventive care: Approximately 84.08% of participants with private insurance had one or more preventive care visits, while only 77.31% of those with public insurance received such care.

3. Does the caregiver's employment status affect the type of insurance they can afford? The first visualization shows participants with public insurance, while the second displays those with private insurance.

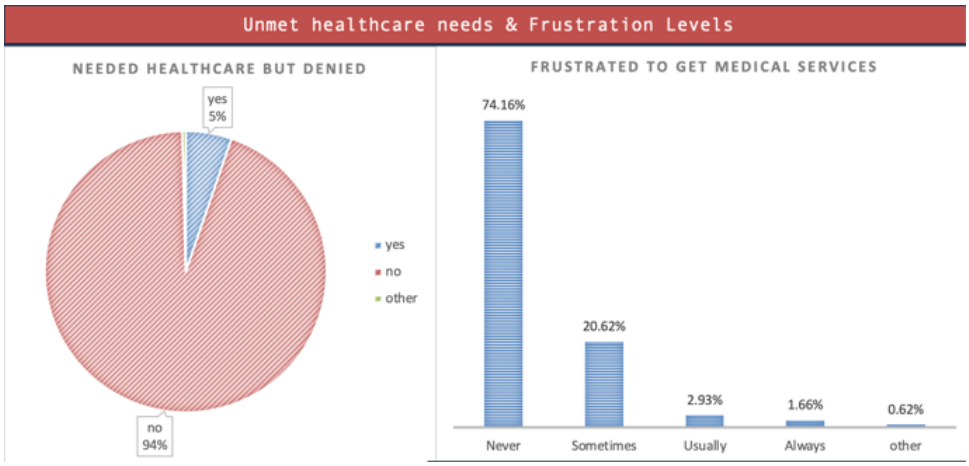


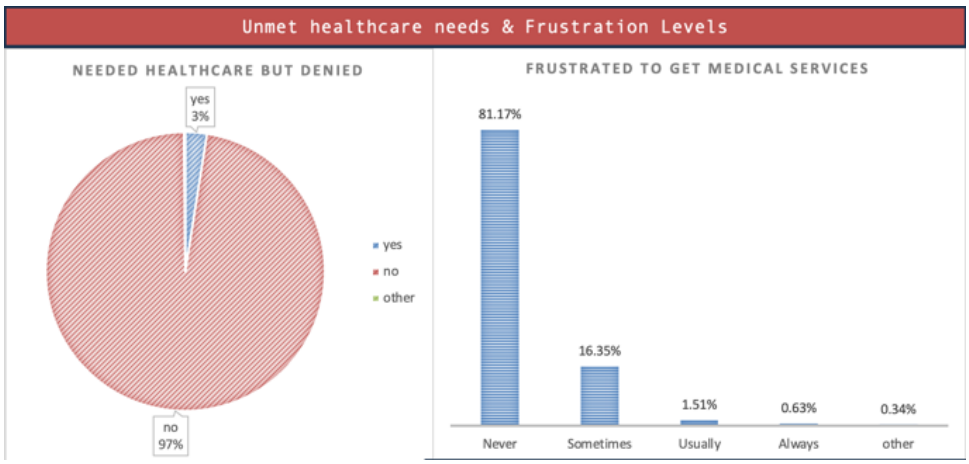
The data suggests that employment status influences the type of insurance chosen. Employed caregivers tend to opt for private insurance. Specifically:

- Caregivers in the 200-399% FPL and 400% FPL or greater categories predominantly choose private insurance.
- Caregivers in the 0-99% FPL and 100-199% FPL categories mostly choose public insurance.

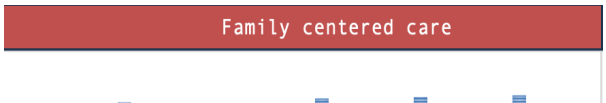
4. Unmet Healthcare Needs: Public vs. Private Insurance: A total of 8% of participants did not receive necessary healthcare when needed, with 5% of these being public insurance holders

and 3% being private insurance holders. Regarding frustration with accessing medical services, 2.14% of private insurance participants and 4.59% of public insurance participants reported usually or always feeling frustrated.

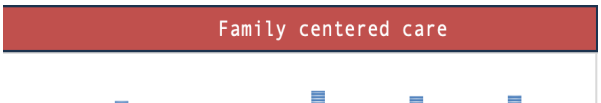




5. Is family-centered care better with public or private insurance? The first visualization shows public insurance stats, while the second shows private insurance.



	Listen Carefully	Spent time	Sensitivity	Provide specific info	Collaboration
Always	56.05%	48.60%	57.07%	57.42%	58.00%
Usually	19.59%	22.51%	18.01%	18.10%	17.22%
Sometimes	4.52%	7.60%	4.28%	4.17%	4.38%
Never	0.75%	2.30%	1.47%	1.10%	1.33%
dont know	19.08%	18.99%	19.16%	19.20%	19.07%



	Listen Carefully	Spent time	Sensitivity	Provide specific info	Collaboration
Always	65.08%	58.47%	68.18%	66.47%	66.76%
Usually	18.90%	23.22%	15.97%	17.74%	16.84%
Sometimes	2.80%	4.65%	2.38%	2.41%	2.99%
Never	0.26%	0.86%	0.44%	0.38%	0.56%
dont know	12.96%	12.80%	13.03%	13.00%	12.85%

Private insurance participants generally reported better experiences across aspects of family-centered care, such as careful listening, time spent, sensitivity, sufficient information, and involvement.

6. Mental healthcare & Treatment availability: A significant portion of the private insurance participants (95%) did not find it difficult to access mental healthcare, compared to public insurance participants.

7. Insurance performance during COVID-19: Private insurance participants reported better access to video/ phone consultations, but public insurance participants with 48.26% indicate childcare availability compared to 41.66% of private insurance participants. Overall, private insurance appears to offer better access to healthcare services across multiple categories, while public insurance participants face more challenges and frustrations.

Conclusion: This comparative analysis of healthcare access and utilization among children with public versus private insurance during 2021-2022 reveals significant disparities. While children with private insurance generally received more consistent general medical and preventive care, those with public insurance had better access to dental and eye care. Employment status strongly influences the type of insurance selected, with higher-income

families leaning toward private coverage. Additionally, children with private insurance experienced fewer unmet healthcare needs and frustrations when seeking care, especially during the COVID-19 pandemic. Overall, private insurance appears to provide more comprehensive access to healthcare services, though public insurance offers certain advantages in specific areas.